# Occupational Pensions and Inter…rm Job Mobility in The European Union. Evidence from The ECHP Survey.

Vincenzo Andrietti
University of "Tor Vergata", Rome
Department of Economics

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# Abstract

Discussion of problems posed by de…ned bene…t occupational pension plans to the free circulation of private sector workers in the European Union has been mainly driven by theoretical arguments, while little attempt has been made to support these arguments with empirical evidence. The paper's main objective is to …ll this gap, modelling the role of expected pension portability losses on individual job mobility choices in a sample of European Union Member States with di¤erent pension portability rules, and estimating the model with a new longitudinal data set derived from the …rst two waves of the European Community Household Panel survey. Individual job mobility status is seen as endogenously determined through a comparative evaluation of expected bene…ts and costs from mobility. Following Heckman's (1979) two-step procedure, we consistently estimate wage equations parameters and individual mover/stayer structural wage di¤erentials corrected for self selectivity. Maximum likelihood estimation of a structural probit equation accounting for estimated wage di¤erentials allows the recovering of structural mobility costs parameters. In particular, occupational de…ned bene…t pensions seem to act, through pension portability losses, as a signi…cant impedment to individual labour mobility in all countries but Spain, while evidence for Denmark is consistent with full portability of de…ned contribution pensions.

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## Non Technical Summary

This paper provides a comparative empirical analysis of occupational pension rights' portability in a sample of European Union Member States, grounded on a structural econometric model of inter…rm job mobility. Our modelling approach constitutes an enrichment to the previous literature on pension portability, which does not take into account the potential self selectivity problem embedded in indiidual job mobility choices, while extending the empirical applications of the standard Roy's two-sectors self-selection model to estimation of the structural determinants of inter…rm job mobility. In particular, we model the individual job change decision as depending on expected bene…ts and costs from mobility, including pension portability losses expected by early leavers from de…ned bene…t plans, whose comparative evaluation brings individuals to self-select as movers or stayers. This is expressed through a binary selection index representing observed choices. The index is inferred to be positive if the individual has changed job, assuming value one, and negative otherwise. The econometric model is completed by observed movers' and stayers' lifetime wage equations.

Determination of net returns from mobility requires knowledge of individual expected present value of lifetime wages related to the actual choice taken as well as that related to the choice not taken. Given unobservability of alternative wage pro…les, we could estimate the unconditional wage di¤erential for each observationally identical individual using available data, under the hypothesis that individuals are randomly assigned to their mover/stayer status. However, this procedure is likely to generate selectivity bias in the estimates, as far as sample selection is not randomly made and individuals choosing to move or to stay are those who gain more than average in doing so.

Following Heckman's (1979) two-step procedure we obtain consistent estimates of sample-selection corrected structural wage equations for movers and stayers, as well as a measure of the individual wage di¤erential. Maximum likelihood estimation of a structural probit equation for the probability of inter…rm job mobility allows us to identify the structural mobility costs equation and wage di¤erential parameters. The model tests also for the existence of wage premia accruing to pension covered workers through a pension coverage dummy variable included in wage equations.

Empirical results show that in each country pension portability rules play an important role in individual job mobility choices. In particular, the pension wealth loss expected by members of de…ned bene…t plans while moving to a di¤erent employer reduces significantly the probability of individual job mobility in all countries but Spain, while results for Denmark are consistent with our expectation that de…ned contribution plan coverage does not signi…cantly a¤ect individual job mobility decisions, given that they guarantee full portability of accrued pension rights. This con…rms earlier results for the United Kingdom, while providing completely new evidence for Denmark, Ireland, the Netherlands and Spain. It is however important to highlight that the role of de…ned bene…t pensions in the labor market is much more relevant in those countries, like the Netherlands, the United Kingdom and Ireland, where pension plans cover large sections of private sector labor force. Portability of the pension rights within these countries has been much improved over the last two decades. Our empirical …ndings show however that de…ned bene…t occupational pensions in these countries are still far from being fully portable.

# 1 Introduction

European Union (EU) legislation on portability of supplementary pension rights accrued by private sector migrant workers is at an early stage. The approach followed by the recent directive on the subject is to preserve these rights at least at the level guaranteed in case of within borders mobility. Country speci…c pension regulation is therefore crucial for both within and cross borders portability of supplementary pension rights.

National pension portability policies should take into account e¢ciency and equity issues raised by a limited portability of occupational pensions in relation to country speci…c labor market structures and pension coverage outcomes. Moreover, legislative action aiming to improve pension portability within national borders should be supported by empirical analisys aiming to de…ne the role played by employer provided pensions on individual mobility decisions. Such evidence is however lacking in most of the EU countries and the main objective of the paper is to …ll this gap. Our modelling approach innovates on previous US empirical studies on pension portability, accounting for potential self selection bias embedded in individual mobility choices, while at the same time extending empirical applications of the standard two-sectors Roy's self-selection model to estimation of the structural determinants of inter…rm job mobility.

We model the individual job change decision as depending on expected bene…ts and costs from mobility, including pension portability losses expected by early leavers from de…ned bene…t plans, whose comparative evaluation brings individuals to self-select as movers or stayers. This is expressed through a binary selection index representing observed choices. The index is inferred to be positive if the individual has changed job, assuming value one, and negative otherwise. The econometric model is completed by observed movers' and stayers' lifetime wage equations.

Determination of net returns from mobility requires knowledge of individual expected present value of lifetime wages related to the actual choice taken as well as that related to the choice not taken. Given unobservability of alternative wage pro…les, we could estimate the unconditional wage di¤erential for each observationally identical individual using available data, under the hypothesis that individuals are randomly assigned to their mover/stayer status. However, this procedure is likely to generate selectivity bias in the estimates, as far as sample selection is not randomly made and individuals choosing to move or to stay are those who gain more than average in doing so.

Following Heckman's (1979) two-step procedure we obtain consistent estimates of sample-

selection corrected structural wage equations for movers and stayers, as well as a measure of the individual wage differential. Maximum likelihood estimation of a structural probit equation for the probability of inter-firm job mobility allows us to identify the structural mobility costs equation and wage differential parameters. The model tests also for the existence of wage premia accruing to pension covered workers through a pension coverage dummy variable included in wage equations.

The paper is divided into eight main sections. The next section provides an economic analysis of occupational pensions portability and briefly reviews the pension-mobility literature. Section 3 describes the data set used for the analysis. Section 4 provides preliminary evidence on the relationship between pensions, mobility and wages in a sample of EU countries. Section 5 summarizes country specific and EU pension portability regulation. Section 6 presents an econometric model of inter-firm job mobility, while section 7 is devoted to an illustration of the main empirical results obtained from model estimation. Section 8 summarizes and concludes the paper relating empirical results to portability policies adopted in the countries analyzed.

# 2 Economic Analysis of Pension Portability

Pension portability can be defined as the capacity of workers covered by an occupational pension plan to carry the actuarially fair value of their accrued rights from one job to the next. When a mover is not entitled to full preservation of his accrued rights, either in the old or in the new scheme, pension portability is not guaranteed and a portability loss is expected to arise. The latter can be defined as the shortfall of actual retirement benefits from those that would have been paid if there had been no change in scheme membership as a consequence of job separations during the career. Distinction between defined contribution and defined benefit pension schemes is crucial for portability analysis.

In defined contribution plans employer contributions correspond to the annual pension rights' accrual[1] accumulated into individual accounts and invested on behalf of the employee. A defined contribution pension can be seen as a short term contract with pension compensation just substituting for cash wages in worker's current total compensation. Upon retirement the worker is entitled to an actuarially fair lump sum which can then be converted into a pension annuity. The worker could retire or quit at any time, after a

[1] This figure, usually referred to as pension compensation, can be defined as the variation in accrued pension wealth deriving from continuing employment, net of returns on accumulated pension wealth.

typically short vesting period[2], receiving an actuarially fair lump-sum distribution equal to his accumulated pension wealth.

In de…ned bene…t plans the sponsoring employer promises to the worker the payment of a pension annuity of the following form:

$$P_R = b(R - t_{k+1})W(R); \tag{1}$$

where:

$P_R$ = pension annuity accrued at normal retirement age R;

$t_{k+1}$ = age of entry into the pension plan;

$R - t_{k+1}$ = years of pensionable service accumulated at retirement;

$b$ = annual accrual rate;

$W(R)$ = …nal wage at retirement.

Assuming vesting after $V$ years of service, if the worker separates after $t - t_{k+1} < V$ years of service, he forfeits pension rights amounting to:

$$P_{VestingLoss} = b(t - t_{k+1})W(t): \tag{2}$$

In the case where separation occurs after the vesting period but before retirement, $V < t - t_{k+1} < R$, the worker will be entitled to receive, upon retirement, a pension annuity calculated as:

$$P_t = b(t - t_{k+1})W(t): \tag{3}$$

Even if the worker joined a new job with the same wage, the same wage growth path and the same pension plan, and if he stayed in the new job until retirement, the total pension annuity received from the two pension plans would be smaller than the one he would have received upon remaining with the …rst employer until retirement. The fact that typically $W(t) < W(R)$ implies that the pension annuity calculated by the former plan would weight the former years of pensionable service with a lower …nal wage. Equations (4) to (6) below show the source of the Pension Annuity Loss:

$$b(R - t_{k+1})W(R) > b(t - t_{k+1})W(t) + b(R - t)W(R); \tag{4}$$

$$b(t - t_{k+1})W(R) > b(t - t_{k+1})W(t); \tag{5}$$

$$P_{AnnuityLoss} = b(t - t_{k+1})[W(R) - W(t)] > 0: \tag{6}$$

[2] De…ned as the minimum lenght of service to be completed in order to obtain pension rights' entitlement.

However, this is only half of the story. The key point here is to know how much a worker is paying for his de…ned bene…t pension in terms of foregone cash wage, that is to know the amount of the annual pension compensation. This latter is strictly dependent on the nature of the de…ned bene…t pension contract, which has been analyzed within two opposite frameworks.

Under the spot contract theory view, proposed by Bulow (1982), de…ned bene…t pensions are seen as short term contracts, where the parties involved can terminate the contract anytime. Workers are required to forego wages corresponding to the pension rights to which they would be entitled upon termination of the contract while …rms are liable to pay contributions corresponding to the "legally accrued" pension liabilities. In this framework, the annual pension compensation and the separation pension annuity are calculated on the current wage, implying that the worker does not su¤er any portability loss upon separation.

Alternatively, in the implicit contract theory view, proposed by Ippolito (1985), the pension contract is considered as a long term agreement between the worker and his employer where the worker is required to forego wages equal to the value of pension rights to which he would be entitled upon retirement, conditionally on not leaving the …rm. At the same time, the employer committs to not terminating the worker (and the plan) through reputational arguments[3]. Annual pension compensation represents here a constant portion of retirement wage. Upon separation the worker receives from the …rm only the "legally accrued rights"; the worker's pension loss is thus proportional to the di¤erence between the retirement wage and the separation wage, as shown in (6).

These di¤erent views of the pension contract lead to di¤erent position in the controversial debate on the e¤ects of pension portability on labor market e¢ciency[4]. If the labor market is seen as a spot market, quits and layo¤s can be considered as instruments permitting the absorbtion of any shock to demand or technology, through reallocation of workers to their highest productive job match. The spot contract view follows the theory of equalizing di¤erences in requiring the observed wage di¤erential to equalize the total monetary and nonmonetary advantages or disadvantages among di¤erent jobs, and therefore also the composition of pay packages, included pensions and other fringe bene…ts as substitutes for direct cash wage payments. Pension contracts can thus be considered as short term

[3] Although …rms have an incentive to …re workers and collect a capital gain on their pensions, concern about labor market reputation and the ability to write similar productivity-enhancing contracts in the future can prevent this from happening.

[4] See Dorsey (1995).

contracts and their portability is a condition for labor market e¢ciency.

Alternatively, in the contract theory view the matching of workers to jobs in the labor market depends on the availability of match-speci…c rents or quasi-rents. Productivity gains deriving from long job tenures are emphasized and de…ned bene…t pensions are seen as an instrument to increase labour market e¢ciency through preserving productive job matches, stimulating …rm speci…c human capital (training) investments on workers, or creating incentives for workers not to shirk. The pension contract is considered here as a long term agreement betwen the worker and his employer where the non-portability of pensions is a condition for labor market e¢ciency.

Empirical evidence generally supports the implicit contract view. First, direct evaluation of the impact of de…ned bene…t pension accruals on cash wage pro…les over tenure levels suggest that workers pay for a "stay pension"[5]. Second, empirical studies provide evidence of a signi…cant negative relationship between pensions and job mobility, supporting indirectly the implicit contract view. Earlier studies focus either on the impact of a pension coverage dummy variable on the probability of job mobility expressed through probit/logit reduced form equations[6], or on the impact of vesting provisions on tenure expressed through hazard rate models[7].

More recent literature[8], starting from the established empirical …nding that individuals with pension coverage have lower turnover, aims to explain through more elaborate models the primary causes of this behaviour. Under an implicit contract framework, standard motivations for the predicted impact of pensions on mobility are portability losses, imposed by de…ned bene…t plans to workers switching job before retirement, and compensation premia accruing to pension covered workers and acting as e¢ciency wages in preventing shirking, in economizing on hiring and training costs, and in optimally matching workers to jobs. Allen, Clark, and McDermed (1993) introduce self-selection as a further explanation of observed lower mobility rates among pension covered workers. De…ned bene…t pension formulas based on …nal salary include a "bonding"[9] component that imposes sizeable pension wealth losses to workers who leave the …rm before the end of the implicit pension contract.

[5] See Ippolito (1985) and Kotliko¤ and Wise (1985).

[6] Mitchell (1983).

[7] Wolf and Levy (1984).

[8] Allen, Clark and McDermed (1988, 1993), Gustman and Steinmeier (1993).

[9] Enforcement of implicit long term employment contracts usually requires workers to "post a bond", accepting steep age-earnings pro…les and deferred compensation. This latter mechanism, imposing exit costs to workers who leave the …rm, discourages quits and layo¤s for shirking. In this framework pensions are seen as an e¢cient way to defer wages while substituting for mandatory retirement (Lazear, 1979).

Pension portability losses are thus thought to act as a self-selection device inducing "stable" workers to join pension covered jobs while screening out workers who are likely to quit or to be laid o¤[10]. The causation here runs in the opposite direction to the …nancial disincentive mechanism. The decision to join a pension covered job is seen as endogenous and it is the "intrinsic stability" of pension covered workers that determines their lower turnover rates; the self selection mechanism thus allows to capture unobservable heterogeneity related to the workers' quit propensity. The mobility decision is also seen as endogenous, but driven by di¤erent determinants for workers covered by an occupational pension plan and those without pension coverage. Estimation, based on US Panel Survey on Income Dynamics (PSID) data, of a switching bivariate probit model of pension coverage and turnover leads the authors to conclude that the main reason why lower turnover is observed among workers covered by pensions is the prospect of capital losses of pension wealth, while there is no change in turnover at the point of vesting and compensation premia accruing to pension covered workers signi…cantly reduce labor mobility. The expected capital loss has however little e¤ect on the unconditional sorting of workers by pension coverage, even if there is evidence that "stable" workers self-select into pension covered jobs on the basis of their observable characteristics.

A di¤erent research approach is followed by Gustman and Steinmeier (1993). They question the causal interpretation usually attributed to the strong negative correlation between pension coverage and measures of job mobility or tenure. Rather, they look for other causal factors whose omission could have generated this correlation, suggesting in particular that causality may run from the implicit contract, interpreted as the omitted factor, to mobility and pension design. As implicit contracts may provide the payment of compensation premia to pension covered workers, the authors estimate the relative role of lifetime e¢ciency wage premia versus pension backloading on job mobility. Using the US Survey of Income and Program Participation (SIPP) data, they model the individual job change decision betweeen two waves of the panel as depending on current as well as on alternative job lifetime wage earnings, on a constructed pension backloading variable and

[10] Ippolito (1997) proposes an extension of this theoretical argument. Assuming that workers can be classi…ed as "low" or "high" discounters and that low discounters have some characteristics that is ex-ante unobservable but valuable to the …rm (such as higher productivity or lower turnover rates), he argues that de…ned contribution plans, as well as de…ned bene…t plans, are natural candidates for sorting workers on the basis of their unobserved discount rate. In particular backloaded structure of de…ned bene…t plans attracts low discounters, while actuarially fair lump sums provided to early leavers by de…ned contribution plans encourage the departure of mistakenly hired high discounters early in tenure.

on a set of other regressors proxying mobility costs. Imposing joint normality on wages and job decision equations error terms they estimate the model through a maximum likelihood procedure. This procedure however does not account for self selection of individuals when the mobility decision is made endogenous. They …nd that e¢ciency wage premia rather than backloaded pension accrual patterns are the primary cause for the lower turnover rates of workers covered by de…ned bene…t pension plans, and that even fully portable de…ned contribution plans are associated with lower mobility.

Empirical models have mainly been tested on U.S. data, while there is almost no evidence on pension-mobility patterns for European Union countries[11]. However, the recent launch of the European Community Household Panel (ECHP) survey, carried out at EU level, provides country speci…c longitudinal data sets suitable for a comparative analysis of the pensions-mobility relationship. The next section describes this data source illustrating its main advantages and limitations for our research purposes.

# 3 Data: The ECHP Survey

The ECHP is a standardized, multi-purpose, annual longitudinal survey[12] collected since 1994 in 12 European Union Member States under Eurostat coordination. Its aim is to represent EU households and individuals both cross-sectionally and longitudinally, re‡ecting population changes over time through a continuous evolution of the sample. The survey is structured in the form of annual interviews to a selected representative sample of household members in each State, covering a wide range of subjects like demographics, labor force behavior, income, health, education and training, migration and housing, poverty and social exclusion. Interviews are conducted following a standardized questionnaire, although each country is allowed to modify the questionnaire's wording to some extent, in order to re‡ect their own institutional arrangements.

For the purposes of our analysis we have chosen a sample of 5 countries: Denmark, Ireland, Netherlands, Spain and United Kingdom. The choice of this particular sample has

[11] Published work by Mealli and Pudney (1996), based on 1988/89 Retirement Survey data, and by McCormick and Hughes (1984), based on 1973/74 General Household Survey data, provides evidence for the United Kingdom consistent with the pension …nancial disincentives explanation of pension covered workers' lower turnover.

[12] For an extensive and critical analysis of the ECHP survey structure, see Peracchi (forthcoming). Those interested in the complete design and structure of the survey are addressed to the Eurostat/Pan Documents' series.

been driven either by consideration of the relative development of occupational pension plans in a particular country or by data availability. We have excluded from analysis countries characterized by compulsory supplementary protection (France, Greece) or by very low occupational pension coverage rates (Italy, Portugal). In the same way Germany has been excluded from the sample only because of unavailability of data on pension coverage for both years, while Luxembourg has been excluded because of the limited size of its sample. For each country a longitudinal dataset linking wave 1 (1994) to wave 2 (1995) has been used. We have then selected a sample of individuals aged between 20 and 64 at the beginning of the sample period, working as employees for at least 30 hours per week in non-agricultural private industries/occupations in both waves.

ECHP provides a number of individual, …rm and job speci…c characteristics, suitable for use in econometric analysis. After selecting the variables speci…ed in the econometric model and deletion of observations with missing values, we have been left with: 1.178 observations for Denmark, 1.117 for Ireland, 1.426 for Netherlands, 2.091 for Spain and 1.404 for United Kingdom.

For the purposes of our analysis it is crucial to know if the worker was covered by an occupational plan at the time when the job mobility decision was taken, and, if it is the case, to obtain a description of pension plan design and characteristics. As to the …rst point, table 1 provides …gures for private sector occupational pensions coverage rate[13], comparing ECHP data with data provided by the European Commission's (EC) Green Paper on Supplementary Pensions[14]. An important limitation to comparability of ECHP data within countries arises from some wording variations in the standard pension coverage questions between wave 1 and 2[15] and from the implementation of these changes in country speci…c questionnaires. It seems that such modi…cations have completely changed the nature of pension coverage questions in Spain, introducing measurement error, while providing at the same time, for countries such as Netherlands, UK, and Denmark, a closer …t of the ECHP pension coverage rate to the EC one. Only Irish pension coverage data

[13] De…ned as the ratio of pension covered full time private sector employees to the number of private sector employees, where pension coverage refers to active membership of an occupational pension plan.

[14] Commission of the European Communities (1997).

[15] In wave 1 the respondent was asked:

-Does your employer provide a supplementary pension scheme to any employees?

If yes: -Are you personally in that scheme?

In wave 2 the questions were changed to:

- Are you a member of a job-related or occupational pension scheme?

are fully consistent in both years with those provided by EC. For purposes of analysis we have therefore assumed that for Ireland and Spain, all workers covered by an occupational pension in 1994 preserve their coverage status in 1995, independently of their mobility choices, while for Netherlands, Denmark and United Kingdom all workers covered by an occupational pension in 1995 were also covered in 1994, also independently of their mobility status.

ECHP data do not provide any information about pension plan typology and rules. Relying on data reported by country speci…c occupational pensions surveys, we assume that workers are covered by de…ned bene…t plans in all countries but Denmark, where de…ned contribution plans are dominant[16]. A further important limitation of the data is the left truncation of the job tenure variable for people that started their job before 1980. This causes an underestimation of expected pension portability losses.

The other key factor for an empirical analysis of the pension-mobility relationship is individual job mobility. In our data set the respondent is considered to be a mover if he changed employer between the …rst and the second interview[17].

Interpretation of job mobility as the outcome of individuals' maximizing behaviour suggests that we should only consider volountary labor mobility. ECHP allows us to distinguish between individual initiated separations (quits) or …rm initiated separations (layo¤s). However, the limited proportion of movers' in the samples, the high proportion of missing values in the quit/layo¤ variables for the United Kingdom, together with some theoretical argument, illustrated in section 6, have suggested that we consider the event of a job change, irrespective of who initiates it, as the unit of analysis.

Now that we have described the fundamental elements needed for pension portability analysis, it is worthwhile to remark that such analysis could be undertaken at two di¤erent levels.

Within-borders pension portability refers to the preservation of pension rights accrued by workers moving within national borders, being strictly tied to country speci…c regulations and pension plan design choices.

Cross-borders pension portability refers to the safeguard of pension rights accrued by

[16] Detailed information on pension plans was however not available for Spain. In this case the assumption that all plans are of the de…ned bene…t type relies on general informations reported in the relevant literature and has then to be taken cautiously.

[17] The "time window" for job change analysis is therefore varying between individuals. Change of employer is determined through informations reported on dates at which the worker stopped work with his previous employer and started with a new one between the …rst and second interview.

workers moving to a di¤erent country. In this case di¤erences in country speci…c pension regulations, including …scal and plan design aspects, enter into the picture putting additional costraints on labor mobility.

The use of ECHP data for purposes of analysis of cross-borders mobility between EU member States is prevented by inadequate follow-up rules, by endogenous attrition bias problems and by the limited sample sizes. The main aim of the paper is then to use these data for a comparative analysis of the role that occupational pensions play in individuals' "within borders" job mobility choices in a sample of EU countries characterized by di¤erent pension regulatory frameworks. The next section provides preliminary empirical evidence on the pensions-mobility relationship.

# 4 Some Evidence on Pensions, Wages and Job Mobility

Figures reported in table 1 represent the …rst element to consider while assessing the role of second tier pension provision within a national pension system. In particular, they give rough indications on the pattern of occupational pension coverage exhibited by each country, as a result of historical, political, economic and social factors. From this perspective we can divide the countries analyzed in three groups.

The …rst is composed by Denmark and the Netherlands, the countries with highest private sector pension coverage rates, …gured as around 80%. In these countries, occupational pension plans have been established mainly at industry wide level through employers' federations and trade unions. The high degree of union coverage and the mandatory nature of participation in industry-wide funds have guaranteed pension coverage of large sections of the workforce.

Ireland and the United Kingdom belong to a second group of countries that seem to have followed a di¤erent pattern of second tier development, with a coverage rate of private sector employees ranging between 40% and 50%. This lower coverage rate can be explained by the fact that, even if occupational pension plans have a long tradition in these countries playing a major role in integrating basic social security pension bene…ts, the choice of plan membership has been left to the individual.

A last, di¤erent pattern of coverage has been followed by Spain, where occupational pension coverage of private sector workers is estimated between 9 and 15%. Most covered

individuals belong to de…ned bene…t plans set up by their employer as a result of collective agreements, through promises supported by book reserves arrangements, or through individual/group policies stipulated by employers with insurance companies.

A preliminary interpretation of the relationship between pensions, wages and mobility in each country is suggested by empirical evidence on mobility rates, conditional on pension coverage status, and mean wages for years 1994 and 1995, conditional on pension coverage and mobility status, reported in table 2 and summarized as follows[18]:

a) mobility rates and pension coverage. There is evidence of a negative relationship between pension coverage and job mobility, being the latter much higher for workers not covered by pensions. The mobility rate di¤erential is particularly strong in the Netherlands (15%) and Spain (11%) while ranging from 5 to 8% in the other countries.

b) mover/stayer wage patterns. Stayers generally have higher average wages than movers, giving rise to a mover-stayer wage gap. Movers experience higher wage growth rates than stayers; the initial wage gap is thus reduced after one year, particularly for non covered employees. This gap, however, does not account for sample selection bias, which could lead to underestimation or overestimation of the average population wage di¤erential.

c) pension/no pension jobs wage patterns. There is evidence that pension covered workers, either stayers or movers, are better paid than workers without pension in both years. This could re‡ect either worker speci…c or job speci…c attributes. If the entire wage di¤erential between workers with and without pension was due to individual characteristics, such as unmeasured ability, the wage on any alternative job would be identical to the current one, and no wage losses would result from a move. If wage on the current job was instead just a re‡ection of job speci…c rather than personal characteristics, identical workers would be paid more on pension jobs than on no pension jobs, either as a result of rent-sharing or because of some productivity enhancing-scheme requiring e¢ciency wage payments. In section 6 we test for the existence of compensating wage premia accruing to pension covered workers through introduction of a pension coverage dummy variable in movers' and stayers' wage equations while controlling for other job and individual speci…c characteristics.

[18] This evidence should be taken cautiously given that sample heterogeneity is not controlled for.

# 5 Portability of Pension Rights in The EU

Promoting labor mobility within the European Union is a fundamental aim of the Community. Application of the principle of workers' freedom of movement stated in the Rome Treaty should guarantee transferability of pension rights, either statutory or supplementary, within the EU area. However, while coordination of mandatory public pension schemes through a number of regulations allows private sector migrant workers to fully preserve their accrued statutory pension rights, legislation on portability of supplementary pension rights is just taking its …rst steps. After a long discussion and various EC proposals, a directive on safeguarding the supplementary pension rights of workers moving within the European Union was adopted by the Council of Europe in June 1998[19]. The directive establishes the right of workers temporarily posted from their employers to another EU State to continue membership in their domestic pension plans, recommending the extension of this right to workers that temporarily migrate while changing employer. Moreover, the hosting State cannot oblige migrant workers to participate in a pension scheme in case they choose to continue membership in the domestic scheme. The Commission has preferred to con…ne its strategy to matters of principle; the principle is that each worker should be able to move to a job in another Member State without su¤ering portability losses from supplementary pension arrangements. According to this approach, the aim of the directive is to preserve migrant workers' pension rights at least at the level guaranteed in the case of within-borders mobility. It is then worthwhile to brie‡y analyze country speci…c within-borders portability provisions reported in table 3[20].

Vesting provisions vary between one and …ve years of service across countries. Conditional upon vesting, the treatment of early leavers' accrued rights in de…ned bene…t plans varies substantially across countries.

Ireland The 1990 Pension Act requires deferred bene…ts of workers leaving a de…ned bene…t plan from 1st January 1996 to be revalued until retirement in line with the Consumer Price Index up to a 4% maximum. However this treatment is limited to pension rights accrued after 1st January 1991.

[19] Directive 98/49/EC.

[20] For an institutional analysis of cross borders pension portability in European Union see Andrietti (forthcoming).

The Netherlands Early leavers' deferred bene…ts are usually volountarily indexed by sponsoring employers, while post retirement indexation of preserved bene…ts becomes compulsory only when the scheme provides indexation for pensions in payment. The 1987 Pensions and Savings Fund Act introduced the obligation for pension schemes to entitle early leavers with a deferred bene…t proportional to the lenght of plan membership. Moreover, occupational pension members changing job after July 1994 have been given the statutory right of tranferring their accrued rights to another pension scheme. Portability of pension rights di¤ers between industry wide plans and company pension plans. Industry wide plans usually guarantee portability of pensionable service within a particular industry, enabling workers to change jobs without losing service credit when they resume work with another employer in the plan. Company pension plans transfer deferred bene…ts through …ve portability clearing-houses called transfer circuits, in which a plan can participate upon satifying a number of requisites. A job leaver has the option of keeping the vested rights in the former employer's plan or to use a clearing-house for transferring them to the new employer's plan. Again, these transfer circuits operate between company plans within a particular industry, so that people moving jobs within industries are not penalized.

Spain Employees leaving a company pension plan have their accrued rights preserved under the scheme they are leaving, but without any revaluation over time. Members of Quali…ed Plans have the option, while leaving their job, to transfer their position to a new scheme, conditional on its quali…cation.

The United Kingdom Early leavers with vested bene…ts can have their accrued rights preserved in the pension scheme. The 1993 Pension Schemes Act requires deferred bene…ts to be revalued until retirement guaranteeing a minimum limited price indexation up to 5% in‡ation. Alternatively they can take a transfer value to a new occupational pension scheme or to a personal pension or purchase an annuity.

# 6 The Model

The literature on pensions and mobility does not share a common view on the role played by …nancial disincentives, compensation premia and self-selection arguments in explaining the lower mobility rates of pension covered workers. Empirical evidence is far from conclusive and further research is needed, together with adequate data. However, it seems to be

evident that mobility is a¤ected not only by the worker's current wage and potential capital loss, but also by how his current compensation compares to that on alternative jobs. Gustman and Steinmeier (1993) follow this approach, but they do not explicitly take into account the sample selection problem arising when the mobility decision is endogenous.

The model presented in this section[21] focuses on the role played by structural wage di¤erentials and expected portability losses in the job mobility decision, while testing for the existence of compensation premia accruing to pension covered workers. We don't consider the self-selection of workers into pension/no pension jobs but we account for potential selectivity bias arising when the individual mobility choice is made endogenous due to potential correlation between the unobservables determining the choice and alternative prospective wages.

The model is based on a binary representation of the job mobility decision. Individuals in the sample are assumed to observe the lifetime earnings wage pro…le in their current job as well as in their next best alternative. They also perceive a variety of pecuniary and non-pecuniary mobility costs either due to the loss of accumulated …rm speci…c human capital or to family and location costs; in addition, workers covered by de…ned bene…t plans expect to su¤er a pension wealth loss while moving to a new job, due to limited portability of their accrued pension rights.

Inter…rm job mobility in this framework represents basically a response to perceived net gains: a worker is expected to move if the discounted returns to a new job exceed the sum of the discounted returns to the current job and the discounted costs of moving. For this reason, one should interpret quits as the appropriate dependent variable. There are several reasons, however, to consider the e¤ect of pension coverage on all job changes. Besides the limited sample size problems mentioned in section 3, a theoretical argument is provided by Borjas and Rosen (1980) and McLaughlin (1991). They argue that in an e¢cient turnover framework a truly meaningful distinction cannot be made between quits and layo¤s since workers wishing to quit could induce a layo¤, while …rms desiring a layo¤ could induce a quit. The choice of "job change" as the unit of analysis is also consistent with the implicit

[21] This model was pionereed by Roy (1951) and since then has been applied to the analysis of a wide variety of individual economic choices, ranging from choice of education level (Willis and Rosen 1979), geographical mobility/migration (Nakosteen and Zimmer 1980, Robinson and Tomes 1982), occupational choice (Rees and Shah 1986) and inter…rm job mobility (Borjas and Rosen 1980; Simpson 1990; Kidd 1991). The focus of these studies is mostly on the consequences of the choice taken, that is on estimation of returns from mobility and average wage di¤erentials, while we are rather looking for the causes of job mobility.

contract view of pensions, which predicts, on the basis of reputational arguments, lower layo¤ rates for pension covered workers. On the grounds of these arguments we therefore assume all turnover to be "e¢cient" irrespective of who initiates it.

The mobility choice of individual i depends on the following simple rule:

$$I_i^{\alpha} = Y_{mi} - Y_{si} - C_i \geq 0; \tag{7}$$

where:

$Y_{mi}$ is the expected present value of lifetime earnings on the assumption that the individual moves into his best alternative job;

$Y_{si}$ is the expected present value of lifetime earnings on the assumption that the individual remains in his current job;

$C_i$ is the expected present value of costs associated with mobility.

The individual mobility choice in (7) is thus based on an ex-ante comparison. The individual moves to a di¤erent job if his expected lifetime earnings gains exceed mobility costs $Y_{mi} - Y_{si} > C_i$. Otherwise he stays in his current job.

In representing the individual decision empirically we have two main problems. First, we don't observe lifetime wage earnings for actual movers and stayers but only current earnings. However, current earnings can be considered as a proxy of lifetime earnings[22].

The second, and even more important, problem is that we cannot observe the current wages conditional on individual mobility status; we can only observe the current wage conditional on the choice actually taken. We have then to use the estimated coe¢cients

[22] Franco Peracchi made me aware that under this approach individual expected lifetime wage earnings are supposed to follow a random walk process, with current earnings as the best predictor for future earnings.

Another approach would have been to assume a constant, but unobserved, rate of future wage growth, discounting back at a constant interest rate the streams of future wages and assuming that the individual stays in his job until retirement, on the basis of the following formula:

$$LifetimeWage = \sum_{t=0}^{R} Y_t e^{(g^e - i^e)t};$$

where:

$g^e$ =expected nominal rate of wage growth

$i^e$ =expected nominal discount rate

However, as suggested by Simpson (1990), these approaches are similar in that both implicitly assume that available information about current wages is indicative of lifetime wages.

of the actual movers and stayers to predict the wages of potential movers and stayers, following a standard "as if" procedure.

Equation (7) can be expressed as proportional to the stayers' expected lifetime earnings, dividing it by $Y_{si}$:

$$I_i^* \propto \frac{Y_{mi} - Y_{si}}{Y_{si}} - \frac{C_i}{Y_{si}}. \tag{8}$$

Moreover, given that the percentage earnings differential $\frac{Y_{mi}-Y_{si}}{Y_{si}}$ can be approximated by $\ln Y_{mi} - \ln Y_{si}$ and that $c_i = \frac{C_i}{Y_{si}}$, we can rewrite (8) in the following form:

$$I_i^* = \ln Y_{mi} - \ln Y_{si} - c_i. \tag{9}$$

$c_i$ can take any sign. It is however not directly observable, and for empirical purposes we need to use proxy variables reflecting net costs from moving associated with observable individual characteristics such as human capital, firm specific capital, pension portability losses and random unobservable elements:

$$c_i = \gamma_c' X_{ci} + v_{ci}; \tag{10}$$

where:

$X_{ci}$ is a vector of personal and 1994 job specific variables, which includes expected pension portablity losses;

$\gamma_c$ is a vector of unknown parameters;

$v_{ci}$ is a continuous random variable distributed indipendently of $X_{ci}$ with zero mean and variance $\sigma_c$.

The selection index (8) can be written as a probit model:

$$I_i^* = \delta(\ln Y_{mi} - \ln Y_{si}) + \gamma_c' X_{ci} + v_{ci}; \tag{11}$$

where $I_i^*$ is not observed but has a dicotomous observable realization $I_i$ which is related to $I_i^*$ as follows:

$$I_i = 1 \text{ if } I_i^* > 0;$$

$$I_i = 0 \text{ if } I_i^* < 0.$$

A semilog form is used to estimate the natural logarithm of hourly net wages because wages cannot take on a negative value. Wage equations are specified, following human capital theory, in terms of education, gender, experience, and job specific variables like

industry, occupation, supervisory status, employer size and occupational pension coverage, as follows:

$$\ln Y_{mi} = \beta_m' X_i + v_{mi} \tag{12}$$

$$\ln Y_{si} = \beta_s' X_i + v_{si} \tag{13}$$

where:

$\ln Y_{mi}$ is the natural logarithm of hourly net 1995 wage for movers;

$\ln Y_{si}$ is the natural logarithm of hourly net 1995 wage for stayers;

$X_i$ is a vector of personal and 1995 job specific variables;

$\beta_m, \beta_s$ are vectors of unknown parameters;

$v_{mi}, v_{si}$ are continuous random errors containing unobservable variables, such as individual abilities and specific capital that are useful in the chosen job, distributed indipendently of $X_i$ with zero mean and unknown variances $\sigma_m, \sigma_s$.

Equations (11), (12), and (13) represent the structural model of interfirm job mobility. Substituting from (12) and (13) into (11) yields the reduced form selection index:

$$I_i^* = (\beta_m' - \beta_s')X_i - \beta_c' X_{ci} + (v_{mi} - v_{si}) - v_{ci} \tag{14}$$

$$= \gamma' W_i + v_i.$$

where:

$W_i = [X_i, X_{ci}]$;

$\gamma = [(\beta_m - \beta_s), -\beta_c]$;

$v_i = (v_{mi} - v_{si}) - v_{ci})$.

Since the parameters of the reduced form probit equation are estimable only up to a scale factor, we can assume, without any loss of generality, that $v_i$ has a unit variance.

The decision rule (14) selects individuals into movers and stayers according to their largest expected present value. Therefore, wages actually observed in each group are not random samples of the population, but truncated samples.

The expected value of worker i's wage conditional on observed characteristics and mobility status is:

$$E(\ln Y_{mi} | X_i, W_i, I_i = 1) = \beta_m' X_i + E(v_{mi} | X_i, W_i, I_i = 1), \tag{15}$$

$$E(\ln Y_{si} | X_i, W_i, I_i = 0) = \beta_s' X_i + E(v_{si} | X_i, W_i, I_i = 0). \tag{16}$$

Knowledge of the functional form of the conditional mean errors allows estimation of the model parameters. Assuming that the error terms $(v_{mi}; v_{si}; v_i)$ are indipendent of $(X_i; W_i)$ and have a trivariate normal distribution, with a zero mean vector and unknown variance covariance matrix:

$$\mathbf{X} = \begin{bmatrix} \sigma_m & \sigma_{sm} & \sigma_{vm} \\ \sigma_{ms} & \sigma_s & \sigma_{vs} \\ \sigma_{mv} & \sigma_{sv} & 1 \end{bmatrix};$$

equations (15) ¡ (16) may be rewritten as:

$$E(\ln Y_{mi} | X_i; W_i; I_i = 1) = \beta_m' X_i + \sigma_{mv} \lambda_{mi}(\gamma' W_i); \tag{17}$$

$$E(\ln Y_{si} | X_i; W_i; I_i = 0) = \beta_s' X_i + \sigma_{sv} \lambda_{si}(\gamma' W_i); \tag{18}$$

where $\lambda_{mi}(\gamma' W_i) = \frac{\phi(\gamma' W_i)}{\Phi(\gamma' W_i)}$ and $\lambda_{si}(\gamma' W_i) = -\frac{\phi(\gamma' W_i)}{1 - \Phi(\gamma' W_i)}$ are the Inverse Mills' ratios; $\phi(\cdot)$ and $\Phi(\cdot)$ being the standard normal density and cumulative distribution function respectively.

Selectivity bias in wage equations estimation derives from the correlation between the unobserved determinants of inter…rm job mobility and the unobserved wage related characteristics, such as ambition and propensity to human capital investments. If the errors in the selection and outcome equations were uncorrelated, the regression function for the outcome on the selected subsample would be the same as the population regression function. In this case there would not be any selection bias and ordinary least square methods could be used to consistently estimate $\beta_j$ on the selected subsample. In general, however, this does not occur.

The model is estimated using Heckman's (1979) two-step procedure. The …rst stage involves maximum likelihood estimation of the reduced-form probit equation (14) on the full sample. The second stage consistently estimates wage equations' parameters through inclusion of the estimated inverse Mills' ratio. The sign of the selectivity correction terms, $\sigma_{mv}\hat{\lambda}_{mi}$ and $\sigma_{sv}\hat{\lambda}_{si}$; depends on $\sigma_{mv}$ and $\sigma_{sv}$: A positive sign of the selectivity correction term implies positive selection in the chosen category, suggesting that the observed sample mean wage of job stayers/movers for a given set of characteristics is higher than the population mean[23].

[23] A negative sign of the selectivity term implies that the observed sample mean wages for individuals with a given set of characteristics and conditional on their mobility status is lower than the population mean, but this does not necessary imply that these individuals would have done better chosing the alternative status. That is, their ex-ante individual structural wage di¤erential could still be positive.

Heckman's two-step estimator is however inefficient for two reasons. First, the error terms in sample selectivity corrected wage equations are heteroskedastic. A second source of inefficiency is introduced by the fact that the inverse Mills' ratios are not directly observed but rather estimated in the first step. Standard errors of estimated parameters in wage equations have then to be corrected to account for these problems[24]. We perform this task computing Heckman's (1979) corrected variance-covariance matrix[25] as well as, for the purpose of comparison, using nonparametric bootstrap and jackknife methods[26]. Wage equations' estimated coefficients are then used to predict log-wage earnings for each individual i; given his own characteristics $X_i$ :

$$\ln Y_{mi} = \alpha_m' X_i + \beta_{mv} \hat{\sigma}_{mi}; \tag{19}$$

$$\ln Y_{si} = \alpha_s' X_i + \beta_{sv} \hat{\sigma}_{si}; \tag{20}$$

and to compute the individual ex-ante structural wage differential:

$$\ln Y_{mi} - \ln Y_{si} = (\alpha_m' - \alpha_s') X_i + (\beta_{mv} \hat{\sigma}_{mi} - \beta_{sv} \hat{\sigma}_{si}). \tag{21}$$

This measure has two components: the first term is the structural mobility wage gain, representing the difference between systematic components of wages in the alternative as well as in current job, while the second term accounts for random differences not captured by wage equations but crucial in determining the job mobility decision. The structural wage differential is then substituted in (11) to obtain a structural probit function:

$$I_i^* = \delta(\ln Y_{mi} - \ln Y_{si}) - \gamma_c' X_{ci} + \varepsilon_i; \tag{22}$$

where: $\varepsilon_i = \delta(\vartheta_{mi} - \vartheta_{si}) - v_i$.

Maximum likelihood estimation[27] of equation (22) allows us to obtain estimates of the structural parameters related to the principal determinants of the individual mobility choice.

The model requires identifying exclusion restrictions[28]. First, identification of wage equations parameters requires that at least one exogenous variable belonging to the vector

[24] There exists a substantial literature on estimating two-step estimator's variance-covariance matrix (Heckman 1979, Lee, Maddala and Trost 1980, Greene 1981, Maddala 1983).

[25] The codes, programmed under STATA version 6, are available upon request from the author.

[26] For a review of these methods, see Peracchi (forthcoming).

[27] We account for the fact that the structural wage differential is only an estimate of the true one applying White's Variance-Covariance Matrix Correction.

[28] Lee (1979).

$X_{ci}$ be not contained in $X_i$[29]. Second, identi…cation of the parameter ° in the structural probit equation requires that at least one exogenous variable belonging to the vector $X_i$ be excluded from $X_{ci}$: Both these conditions are easily satis…ed by our underlying economic model where the reduced form selection index contains variables included in the mobility costs equation but excluded from wage equations, while the latters are speci…ed with $X_i$ containing job speci…c variables not included in $X_{ci}$: A further identifying exclusion restriction, $¾_{ms} = 0$, accounts for the fact that sample observations cannot re‡ect the correlation between $\ln Y_{mi}$ and $\ln Y_{si}$.

Heckman's parametric procedure exploits the relationships between selection and outcome equations' errors operating through distributional assumptions. In particular the joint normality assumption implies linear relationships between selection and outcomes equations' errors. Recent research has however cast some doubts on selection models based on normality, the main critical argument relying on a seemingly lack of robustness of the parameters estimates to misspeci…cation of the mantained distributional assumptions[30]. Two broad approaches have been developed in the sample selection literature to deviate from normality[31]. The …rst relaxes the normality assumption at least in one stage of estimation, substituting it with a di¤erent known distribution. Assuming that the error term distribution in the selection equation is known but not normal and that the outcome equation error conditional on the selected regime is a linear function of the selection equation error allows a consistent …rst step estimation with methods other than probit. The alternative approach, proposed by the most recent literature is semiparametric, in that the outcome equation error conditional on the selected regime is not implicitly, through distributional assumptions (normality), or explicitly assumed to be a linear function of the selection's equation error. Rather, this relationship is represented by an unknown function. In a recent article, Lanot and Walker (1998) compare the wage di¤erential estimates obtained using OLS with those obtained through a conventional Heckman two-step and a

[29] This avoids multicollinearity between regressors in the wage equation in case of linearity of the Inverse Mills' ratio. However, in principle identi…cation could be attained even only relying on non linearity of the latter.

[30] Model estimates based on the normality assumption, either MLS or OLS are inconsistent under non-normality (see Heckman and Honoré 1990). Inconsistency of parameter estimates could also arise from incorrect speci…cation of the wage and selection equation and possible endogeneity of right-hand side variables (e.g. education, occupational pension coverage, etc.). All these issues are ignored in this paper.

[31] Vella (1998) provides a survey of the literature on parametric, semiparametric and semi-non parametric sample selection estimators.

semi-parametric estimator[32]. They …nd that most of the di¤erence in the estimated union-nonunion wage gaps can be attributed to the constant terms, and conclude, according to previous results by Newey, Powell and Walker (1990), that their semiparametric results are close to those obtained through the conventional Heckman's two-step while being largely di¤erent from least squares estimates which do not take union status endogeneity into account. These results, nothwithstanding the misspeci…cation caveats, have provided us with a rationale for using the Heckman two-step procedure, while estimation of the model through semiparametric methods is left as an objective of our future research.

# 7 Empirical Results

## 7.1 Reduced Form Probit Estimates

Reduced form probit estimates reported in table 4 provide very limited information about the validity of the theoretical framework captured by equations (11) ¡ (13), giving only the total e¤ect of each regressor on the probability of job mobility[33]. Moreover, the sign of most variables included in the reduced form probit equation is a priori uncertain, thus raising interpretation problems on estimated coe¢cients' values.

The total e¤ect of education in the reduced form equation can be decomposed into:

a) the e¤ect of education on the wage o¤ered in the present job. General education endows individuals with general human capital which is expected to give positive returns in term of higher wages;

b) the e¤ect of education on alternative wage o¤ers, expected to be positive;

c) the e¤ect of education on mobility costs, expected to be negative, as more educated workers are supposed to have access to better information, with a reduction of mobility costs.

These three e¤ects can only be be distinguished by estimating structural equations (11) ¡ (13) directly. In turn, these structural estimates can be evaluated, since the independent e¤ects of education on wages and mobility costs are predicted a priori. The same

[32] The estimator is based on Klein and Spady (1993) for the selection equation parameters, Newey (1988) for the structural equations' slope parameters, and Andrews and Schafgans (1998) for the intercept term.

[33] The base case individual is male, married, without children, house owner, with upper secondary education, not covered by employer provided occupational pension, health insurance or training, not searching on the job, working as a white collar worker with no supervisory role in a medium …rm in the manufacturing industry.

argument is valid for all the variables included in both wages and mobility costs equations. For variables representing work experience, in particular, it is expected that:

a) the e¤ect of experience on the wage o¤ered in the present job is positive and increasing at a decreasing rate;

b) the e¤ect of experience on the alternative wage o¤ers is positive and increasing at a decreasing rate;

c) for what concerns the e¤ect of experience on mobility costs, it is well known that work experience re‡ects general as well as …rm speci…c human capital, and that while moving to a di¤erent employer the worker loses partially or totally the accumulated …rm speci…c human capital. In general, it is expected that younger, less experienced, workers are more willing to bear the …xed costs of moving in order to accept a better job, while it is likely that an older worker, having accumulated more …rm speci…c capital, is endowed with a greater …rm attachment. However experience, being linearly dependent from age, also re‡ects di¤erent stages in the life cycle and the probability of changing jobs could decline non-linearly with experience because of changing preferences.

## 7.2 Selectivity in Wage Equations

Tables 5 and 6 present sample-selection corrected wage equations for movers and stayers. The speci…cations have a signi…cant amount of explanatory power - between 32 and 50%- while the F-test rejects the null hypothesis that all slope coe¢cients are equal to zero. Standard errors for estimated coe¢cients are computed with the Heckman procedure as well as with nonparametric bootstrap and jacknife methods. The resulting t-ratios, reported in tables 5 and 6, do not seem to change very much[34]. Therefore the discussion below refers to Heckman's t-ratios when referring to the signi…cance of the estimates at standard levels.

Earnings equations, and consequently mobility choices, can be thought as being affected by two kinds of variables: those that can be observed and thus measured, like job and personal speci…c characteristics, and those unobserved, like the inverse Mills' Ratios. Coe¢cients obtained on $\hat{\gamma}_m$ and $\hat{\gamma}_s$ signal if there is positive or negative selection bias in the movers'/stayers' categories. Reported t-values for $\hat{\gamma}$ coe¢cients simply test for the null hypothesis that $\hat{\gamma}_{m;s} = 0$ (no sample selection). In table 5 we …nd that $\hat{\gamma}_s$ coe¢cients are positive in all countries, while being signi…cant at 95% level in Denmark and Ireland. This

[34] The nonparametric bootstrapped standard errors estimates reported in table 5 and 6 are computed using 200 resamplings.

result suggest a signi…cant negative selection of stayers in the latter countries. $\hat{\lambda}_m$ coe¢cients reported in table 6 are positive in Denmark, the Netherlands and Spain, while being negative in Ireland and in the United Kingdom. In any case the estimated coe¢cients are not signi…cantly di¤erent from zero. These results do not conform to predictions of a theory of comparative advantages, which would sort each worker in his more productive allocation. The signi…cance of the $\hat{\lambda}$ for some countries, however, allows us to emphasize the importance of accounting for sample selection bias for the purposes of our analysis.

Turning to the in‡uence of measured variables on earnings, we notice that education level contributes to explain observed wages in the expected direction. Compared to individuals with upper secondary level education, third level educated stayers earn between 4,1% (Ireland) and 19% (United Kingdom) more, with all coe¢cients, but that of Ireland, signi…cant at 95% level. On the other hand, stayers with lower secondary educational level earn between 2.3% (Netherlands) and 11,6% (Ireland) less than those in the reference category. Movers with higher educational quali…cations earn signi…cantly more only in Denmark (14.3%) and the United Kingdom (24%), while those with lower education earn signi…cantly (at 90 % level) less only in Spain.

Female stayers earn signi…cantly less then their male colleagues in all countries, while this is true for movers only in Denmark and Spain. Experience variables signi…cantly contribute to explain movers' and stayers' wages along the expected direction in all countries, even if in Spain coe¢cients appear not to be signi…cant at standard levels.

As to job and …rm speci…c variables included in movers' and stayers' wage equation, there is evidence that:

a) stayers with supervisory roles are generally signi…cantly better paid in all countries while this is true for movers only in Netherlands and Spain[35];

b) stayers and movers working as managers and professionals have signi…cantly higher wages than those working as white collar employees in all countries. The reverse is generally true for blue collar workers, even if for movers this is less evident;

c) stayers and movers working in small …rms earn signi…cantly less than those working with medium …rms in all countries but Denmark. Stayers working in larger …rms earn generally more, the coe¢cients being signi…cant for Spain and the United Kingdom, while the evidence for movers is mixed;

d) coe¢cients attached to industry variables present di¤erent sign and signi…cance

[35] Note that the dummy variable indicating job supervisory status has been omitted for United Kingdom, because of his high proportion of missing values.

patterns for each country, possibly re‡ecting country speci…c situations a¤ecting wage setting.

Wage equations include an occupational pensions coverage dummy variable which tests for the existence of wage premia accruing to pension covered workers, after controlling for individual and job speci…c characteristics. The coe¢cient values of this variable are generally found to be positive and signi…cant[36], contrary to predictions of the theory of equalizing di¤erences and of the spot contract pension literature. Support given by these …ndings to the implicit contract theory of pensions is however limited, because the wage pension trade-o¤ should be estimated over a long period of employment, rather than over one period (Kotliko¤ and Wise 1985).

## 7.3 Structural Probit Estimates

The …nal step of the procedure is maximum likelihood estimation of the individual probability of inter…rm job mobility, as expressed by the structural probit equation (22). This requires computation of the predicted log wage di¤erential for each individual given his own characteristics, as in (21); and allows to disentangle the structural coe¢cients of the mobility costs equation. For each country a likelihood ratio test of the overall …t of model speci…cation leads to rejection of the null hypothesis that all slope coe¢cients are equal to zero; therefore, the structural probit equation has a signi…cant amount of power in explaining job mobility decisions. The results reported in table 7 give a number of interesting …ndings.

Female workers are generally less likely to change employer than their male colleagues, with estimated coe¢cient signi…cant at standard levels for Denmark, Spain and the United Kingdom. It is frequently argued in the literature that married workers are likely to experience lower chances of realizing a superior job alternative since the costs of moving is expected to rise with additional family members. The same argument should apply to household size. This point is not however so clear cut because extended families could have developed informal networks supporting a job move. Indeed, empirical evidence is generally consistent with the view that individuals belonging to bigger households are more likely to move, at 95% signi…cant level in Netherlands and Spain, while singles are not signi…cantly more likely to move than married workers. As expected, having children is found to a¤ect

[36] Except for Denmark, where the coe¢cient is negative but unsigni…cant for movers and stayers, and Spain where the coe¢cient is negative and unsigni…cant only for stayers.

negatively the chances of moving job, albeit signi…cantly so only in Netherlands.

A prediction found in the literature on migration choices is that renting a house generally makes individuals more likely to move, as job change often implies a change of residence. It could however be true that causation runs in the opposite sense, with residential or geographical mobility driving job change decisions. Our results show that residential moves have a positive e¤ect on the probability of job mobility, even if only for Denmark this e¤ect is signi…cant at 95% level. In the same way, Denmark is the only country where tenants are signi…cantly more likely to change jobs.

Education endows a worker with skills, increasing his ability to adjust to change and to gather information on alternative job opportunities, contributing to reduce mobility costs and thus increasing job mobility. This prediction is not con…rmed by our …ndings which indicate that education lowers the probability of job mobility. However, these …ndings are signi…cant at standard levels only for Spain[37].

Since there are …xed costs associated with moving which must be amortized over the remainder of a worker's career, the likelihood of a job move should fall with worker's age. The model estimates generally accord to this pattern, being signi…cant at standard level in Ireland, Spain and the United Kingdom. As expected, individuals investing resources in looking for another job while employed are everywhere signi…cantly more likely to change their job, at a particular high rate in Denmark (17.8%), Ireland (14.66%), the Netherlands (12.46%) and Spain (9.65%).

"On the job training" can be considered as a mobility cost in that it represents worker's …rm speci…c human capital; the coe¢cient value of this variable has the expected negative sign in all countries, being signi…cant at 95% level in Spain and at 90% level in Ireland and the United Kingdom. In the same way, individuals covered by employer-provided health insurance are generally less likely to change job, but only in Spain and Denmark does this …nding prove to be signi…cant at standard levels.

A positive sign of the predicted wage di¤erential would be interpreted in the sense that the more the predicted mover earnings exceed the predicted stayer earnings for an individual, the more likely he is to move to a di¤erent job. This pattern is generally found in the data but it is signi…cant only in the United Kingdom. We also …nd a negative and signi…cant sign of the wage di¤erential coe¢cient in the Netherlands. However, the latter result should not come as a surprise given that the de…nition of movers includes displaced

[37] The result for Spain could be explained by the fact the majority of job moves are represented by self-reported layo¤s.

workers.

The e¤ect of expected pension portability losses on the probability of job mobility is generally found to be negative and signi…cant. In Spain the coe¢cient is however not signi…cant at standard levels. In this case we suspect that our assumption that all spanish pension plans are of the de…ned bene…t type could be not correct. An even more surprising …nding is that the stronger negative e¤ect (13%) is found in the Netherlands, where at least within-industry pension portability is guaranteed. This could be explained by evidence showing that the great majority of actual job changes involves inter-industry moves. In Denmark, where de…ned contribution plans are almost fully portable, the sign of occupational pension coverage dummy variable is still negative but unsigni…cant. The comparison between sample mobility rates and predicted mobility for di¤erent group of workers, illustrated in table 8, provides further evidence of the good …t of the model.

# 8 Summary and Conclusions

This paper provides a comparative empirical analysis of occupational pension rights' portability in a sample of European Union Member States, grounded on a structural econometric model of inter…rm job mobility. The modelling approach used constitutes an enrichment to the previous literature on pension portability, which does not take into account the self selectivity argument, while extending the empirical applications of the standard Roy's two-sectors self-selection model to estimation of the structural determinants of inter…rm job mobility.

Empirical results show that in each country pension portability rules play an important role in individual job mobility choices. In particular, the pension wealth loss expected by members of de…ned bene…t plans while moving to a di¤erent employer reduces signi…cantly the probability of individual job mobility in all countries but Spain, while results for Denmark are consistent with our expectation that de…ned contribution plan coverage does not signi…cantly a¤ect individual job mobility decisions, given that they guarantee full portability of accrued pension rights. This con…rms earlier results for the United Kingdom, while providing completely new evidence for Denmark, Ireland, the Netherlands and Spain.

It is however important to highlight that the role of de…ned bene…t pensions in the labor market is much more relevant in those countries, like the Netherlands, the United Kingdom and Ireland, where pension plans cover large sections of private sector labor force. Portability of the pension rights within these countries has been much improved over the

last two decades. Our empirical …ndings show however that de…ned bene…t occupational pensions in these countries are still far from being fully portable.

As to desirability of portability reforms, it must be stressed that good public policy analysis should assess expected behavioral reactions of the economic actors involved. Portability policies should then be implemented on the basis of their expected e¤ects on labor supply and demand, job quits, pension coverage, retirement income adequacy and savings. The main arguments advanced to support pension reform proposals towards greater portability are usually grounded on the e¤ects brought by the changing structure of the labor market to traditional equity and e¢ciency arguments. In particular, equity arguments are supported by overwhelming evidence on upward trends of women participation to the labor force and downward trends of replacement ratios o¤ered to workers by social security pensions. E¢ciency arguments are mainly driven by evidence of a shift towards short term contracts even in sectors, like the public one, usually dominated by long term contracts as well as a shift of jobs to economic sectors characterized by lower coverage rates and relying less on de…ned bene…t plans. Those viewing the pension contract as an implicit one contrast these arguments claiming that a greater pension portability would eliminate an important productivity enhancing instrument for employers. This could imply undesirable economic consequences, reducing …rm speci…c investments (such as on-the-job training) together with reducing employer willingness to o¤er a pension plan.

The balance of positive and negative e¤ects stemming from legislative action towards improving pension portability is however uncertain being also dependent on the priority assigned to di¤erent trade-o¤s by policy makers. In the European Union case an institutional argument adds to the traditional economic portability arguments: the application of workers' freedom of movement principle should guarantee full portability of pension rights. If this is considered as a priority of EU countries pension policies, then the relevance of our results is to support the theoretical arguments for improving pension portability with new evidence showing a signi…cant role of de…ned bene…t pensions as a mobility deterrant.

# References


Allen, S., R. Clark and A. McDermed (1988) "Why do pensions reduce mobility?", N.B.E.R. Working Paper No.2509.

Allen, S., R. Clark and A. McDermed (1993) "Pensions, bonding and lifetime jobs", Journal of Human Resources 28 (3), 502-517.

Andrietti, V. (forthcoming) Occupational Pensions and Labor Mobility in The European Union, Doctoral Thesis, University of Rome "Tor Vergata".

Andrews, D. and M. Schafgans (1998) "Semiparametric estimation of a sample selection model", Review of Economics and Statistics 65, 497-517.

Borjas, G. J., and S. Rosen (1980) "Income prospects and job mobility of younger men", Research in Labor Economics 3, 159-181.

Bulow, J. (1982) "What are corporate pension liabilities?", Quarterly Journal of Economics 97, 435-452.

Commission of the European Communities (1997) Green Paper on Supplementary Pensions in The Single Market COM (97) 283, Bruxelles.

Dorsey, S. (1995) "Pension portability and labor market e¢ciency: a survey of the literature", Industrial and Labor Relations Review 48 (2), 276-292.

Greene, W. H. (1981) "Sample selection bias as a speci…cation error: comment", Econometrica 49 (3), 795-798.

Gustman, A. L. and T. L. Steinmeier (1993) "Pension portability and labor mobility. Evidence from the Survey of Income and Program Participation", Journal of Public Economics 50, 299-323.

Heckman, J. (1979) "Sample selection as a speci…cation error", Econometrica 41, 153-161.

Heckman, J. and B. Honoré (1990) "The empirical content of the Roy model", Econometrica 58 (5), 1121-1149.

Ippolito, R. (1985) "The labor contract and true economic pension liabilities", American Economic Review 75, 1031-1043.

Ippolito R. (1991) "Encouraging long-term tenure: wage tilt or pensions?", Industrial and Labor Relations Review 44 (3), 520-535.

Ippolito R. (1997) Pension Plans and Employee Performance, Chicago, University of Chicago Press.

Kidd, M. P. (1991) "An econometric analysis of inter…rm labour mobility", Canadian Journal of Economics 24 (3), 474-501.

Klein and Spady (1993) "An e¢cient semiparametric estimator of the binary choice model", Econometrica 61 (2), 387-421.

Kotliko¤, L. and D. Wise (1985) "Labor compensation and the structure of private pension plans: evidence for contractual versus spot labor markets" in Wise, D. (ed.) Pensions, Labor, and Individual Choice. University of Chicago Press, Chicago.

Lanot G. and I. Walker (1998) "The union/non-union wage di¤erential. An application of semi-parametric methods", Journal of Econometrics 88, 327-349.

Lazear, E. (1979) "Why is there mandatory retirement?", Journal of Political Economy 87, 1261-1284.

Lazear, E. and R. L. Moore (1988) "Pensions and mobility", in Bodie, Z., J. B. Shoven, and D. Wise (eds.), Pensions in the U.S. Economy University of Chicago Press, Chicago.

Lee, L. F. (1979) "Identi…cation and estimation in binary choice models with limited (censored) dependent variables", Econometrica 47 (4), 977-996.

Lee, L. F., G. S. Maddala and R. P. Trost (1980) "Asymptotic covariance matrices of two-stage probit and two-stage tobit methods for simultaneous equations models with selectivity", Econometrica 48 (2), 491-503.

Maddala, G. S. (1983) Limited-Dependent and Qualitative Variables in Econometrics, Cambridge University Press.

McCormick, B. and G. Hughes (1984) "The in‡uence of pensions on job mobility", Journal of Public Economics 23, 183-206.

McLaughlin, K. G. (1991) "A theory of quits and layo¤s with e¢cient turnover", Journal of Political Economy, 91 (1), 1-29.

Mealli, F. and S. Pudney (1996) "Occupational pensions and job mobility in Britain: estimation of a random-e¤ects competing risks model", Journal of Applied Econometrics 11, 293-320.

Mitchell, O. S. (1983) "Frindge bene…ts and the cost of changing jobs", Industrial and Labor Relations Review 37, 70-78.

Nakosteen, R. A.and M. Zimmer (1980) "Migration and income: the question of self selection", Southern Economic Journal 46, 840-51.

Newey, W. K.(1988) "Two step series estimation of sample selection models", mimeo, Princeton University (revised 1991, Working paper, MIT, Department of Economics).

Newey, W. K., J. Powell and J. Walker (1990) "Semiparametric estimation of selection models: Some empirical results", American Ecoomic Review, Papers and Proceedings 80(2), 324-328.

Peracchi, F. (forthcoming) "The European Community Household Panel Survey", in W. Voges (ed.), Dynamic Approaches to Comparative Social Research, Avery Publishers, Aldershot.

Peracchi, F. (forthcoming) Econometrics, John Wiley & Sons, Chilchester.

Rees, H. and A. Shah (1986) "An empirical analysis of self-emploment in the U.K.", Journal of Applied Econometrics 1, 95-108.

Robinson, C. and N. Tomes (1982) "Self selection and interprovincial migration in Canada", Canadian Journal of Economics 14 (3), 517-535.

Roy, A. D. (1951) "Some thoughts on the distribution of earnings", Oxford Economic Papers-New Series 3, 135-146.

Simpson, W. (1990) " Starting even? Job mobility and the wage gap between young single males and females", Applied Economics, 22, 723-737.

Vella, F. (1998) "Estimating models with sample selection bias: a survey", Journal of Human Resources 33 (1), 127-169.

Willis, R. J. and S. Rosen (1979) "Education and self selection", Journal of Political Economy 87, s7-s35.

Wolf, D. A. and F. Levy (1984) "Pension coverage, pension vesting, and the distribution of job tenures" in Aaron, H. and G. Burtless (eds.) Retirement and Economic Behavior, 23-61. Washington, D.C. : Brookings.

## .1 Appendix. Computation of Pension Portability Losses

The annuity formulas presented in section 2 are reported here in terms of present pension wealth values and used for empirical analysis.

The worker's Stay Pension Wealth at time t is calculated on the basis of pensionable service accumulated to date, $(t - t_{k-1})$; and projected wage at retirement, W(R), conditionally upon staying with the …rm:

$$P_S^{Stay} = b(t - t_{k-1})A(t)W(t)e^{g^e(R-t)}e^{-i^e(R-t)}; \tag{23}$$

where it is assumed that:

a) the worker expects to live and to stay with the …rm until retirement;

b) the worker expects the …rm not to go bankruptcy, …re him or otherwise terminating the pension plan;

c) the worker discounts the pension annuity at the nominal expected rate $i^e$;

d) the worker expects current nominal wage to rise continuously until retirement at a nominal rate of $g^e$;

e) the worker's expected life at age t is: ExLife(t);

f) the worker discounts pension bene…ts at the rate $r^e = i^e - \mu\pi^e$, where $0 \cdot \mu \cdot 1$ is the post retirement proportional adjustment to in‡ation and $\pi^e$is the expected in‡ation rate;

g) $A(t) = \frac{1}{(1+r^e)} + \frac{1}{(1+r^e)^2} + ::::: + \frac{1}{(1+r^e)^{ExLife(t)-R}}$:

The Quit Pension Wealth accrued at time t is based upon current service and current wage:

$$P_S^{Quit} = b(t - t_{k-1})A(t)W(t)e^{-i^e(R-t)}: \tag{24}$$

Assuming that the …rm and the worker are tied by a long term implicit contract under which the worker is required to stay with the …rm until retirement, we can compute, subtracting (24) from (23), the worker's expected pension portability loss[38]:

[38] Underlying this standard de…nition there are three assumptions.

a) the mover immediately …nd another job with the same pension plan coverage, while the stayer preserve his pension status. Actually pension coverage dynamics is more complex. By one side movers without pension on their initial job could …nd a pension on their new job while pension covered movers could lose their pension after the move or switch to a pension plan with di¤erent characteristics. By the other side, stayers' pension status could change either upon satisfaction of plans' eligibility conditions or upon plan termination or reversion.

b) actual or potential movers from a pension job preserve the original job's wage. This assumption, even

$$E{:}P{:}Loss = P_S^{Stay} - P_S^{Quit} = [b(t - t_{k-1})A(t)W(t)(e^{g^e(R-t)} - 1)e^{-i^e(R-t)}]: \qquad (25)$$

In case of indexation of the early leaver's wage to price index or to nominal wage growth, the general formula would be:

$$E{:}P{:}Loss = [b(t - t_{k-1})A(t)W(t)(e^{g^e(R-t)} - e^{\pi^*(R-t)})e^{-i^e(R-t)}]; \qquad (26)$$

where: $\pi^* = k\pi^e$ or $\pi^* = kg^e$ with $0 \cdot k \cdot 1$:

For empirical work it is convenient to express the cash equivalent loss in relative terms, as a fraction of the current annual wage $W(t)$:

$$E{:}P{:}Loss = b(t - t_{k-1})A(t)[e^{(g^e - i^e)(R-t)} - e^{(\pi^* - i^e)(R-t)}]: \qquad (27)$$

If $t - t_{k-1} < V$, portability loss would correspond to the worker's stay pension:

$$E{:}P{:}Loss = P_S^{Stay} = b(t - t_{k-1})A(t)W(t)e^{(g^e - i^e)(R-t)}; \qquad (28)$$

or, in current wage terms:

$$E{:}P{:}Loss = b(t - t_{k-1})A(t))e^{(g^e - i^e)(R-t)}: \qquad (29)$$

Expected pension portability loss has a concave shape relative to pensionable service[39], being zero at the extremes of the curve and reaching his maximum around midstream in the tenure cycle. Its basic pattern does not depend upon the worker joining the …rm at any speci…c age or upon speci…c assumptions about discount rate, wage growth, in‡ation, retirement age and pension plan parameters. The size of the expected pension portability loss is however sensitive to all these factors. A higher in‡ation rate increases both the nominal rate of interest and the nominal wage growth rate; these e¤ects compensate in the stay pension formula, while the higher nominal discount rate works to reduce the quit pension, increasing the portability loss. Similarly, a higher rate of real wage growth or

re‡ecting unobservability of stayers potential wage pro…les as movers, is less realistic for older workers, especially for those who experience an involountary move.

c) worker's mobility decision is a lifetime one. If the worker decides to stay, he stays until retirement. However, if a worker does not quit now, he may quit before retirement age sometimes in the future. The potential for a future quit works to reduce the pension loss from quitting now because the probability of collecting a "stay pension" by not quitting now is less than unity (Lazear and Moore 1988).

[39] Accumulation of pensionable service increases the loss while at the same time reducing it by reducing the discounting e¤ect.

a lower real discount rate increases the loss, while a partial indexation of the separation wage to productivity and/or in‡ation works in the opposite direction[40]. Table 9 summarizes country speci…c assumptions used for the computation of expected portability losses[41].

[40] We have estimated the model with di¤erent assumptions about in‡ation as well as real wage growth and in‡ation rates. The estimated coe¢cient on expected pension portability loss as well as its standard error appear to be almost insensitive to these variations.

[41] Danish occupational pensions are not included because of their de…ned contribution nature, that makes them fully portable within national borders. In Netherlands de…ned bene…t pensions are fully portable within industries. Actual movers are thus assumed to su¤er a portability loss only if they have moved to a di¤erent industry, while potential movers' portability losses are computed accounting for the probability of changing industry while changing job (assumed to be 0.5).

Table 1. Occupational Pension Coverage

| | Denmark | Ireland | Netherlands | Spain | UK |
|---|---|---|---|---|---|
| ECHP 1994 | 32.8% | 39.9% | 14.3% | 9% | n.a. |
| ECHP 1995 | 77.8 % | 42.1% | 83.5% | 97.37% | 53.3% |
| EC (1997) | 80% | 40% | 85% | 15% | 48% |

Source: Our elaborations on ECHP data

Table 2. Job Mobility, Wages and Pension Coverage

| | Denmark | | | | Ireland | | | |
|---|---|---|---|---|---|---|---|---|
| | No Pension | | Pension | | No Pension | | Pension | |
| | Stay | Move | Stayer | Mover | Stayer | Mover | Stayer | Mover |
| Observations | 226 | 35 | 828 | 89 | 593 | 78 | 423 | 23 |
| mobililty (%) | | 13.4 | | 8.7 | | 11.6 | | 5.1 |
| Wage 1994 | 6.72 | 5.68 | 6.9 | 6.53 | 5.44 | 4.41 | 8.38 | 7.24 |
| Wage 1995 | 7.27 | 6.94 | 7.26 | 7.18 | 6.02 | 6.08 | 9.05 | 8.75 |
| ¢ Wage % | 8.2 | 22.18 | 5.2 | 9.9 | 10.66 | 37.86 | 8 | 20.85 |

| | Netherlands | | | | Spain | | | | UK | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | No Pension | | Pension | | No Pension | | Pension | | No Pension | | Pension | |
| | Stay | Move | Stay | Move | Stay | Move | Stay | Move | Stay | Move | Stay | Move |
| Observations | 184 | 51 | 1.111 | 80 | 1.715 | 188 | 187 | 1 | 590 | 65 | 733 | 16 |
| mobility (%) | | 21.7 | | 6.7 | | 11 | | .005 | | 9.9 | | 2.1 |
| Wage 1994 | 7.56 | 5.22 | 7.73 | 7.27 | 5.36 | 4.04 | 8.39 | 3.8 | 6.08 | 5.12 | 8.33 | 6.22 |
| Wage 1995 | 6.36 | 5.71 | 7.87 | 7.46 | 6.08 | 4.46 | 9.18 | 4.36 | 6.13 | 5.32 | 8.33 | 7.13 |
| ¢ Wage % | -15.87 | 9.38 | 1.8 | 2.6 | 13.4 | 10.4 | 9.4 | 14.7 | .08 | 3.9 | - | 14.6 |

Source: Our elaborations on ECHP data

Table 3. Within Borders Pension Portability Rules

| | Denmark | Ireland | Netherlands | Spain | UK |
|---|---|---|---|---|---|
| Type of Plan | DC | DB | DB | DB | DB |
| Vesting Rules | 5; Age 30 | 5 | 1 | vary | 2 |
| Early Leaver Index. | - | prices- 4% | prices - option. | no | prices-5% |
| Transfers | yes | yes | yes+tr. circuits | yes-Q.Plans | yes |

Table 4. Reduced Form Probit Model[42]

| | Denmark | Ireland | Netherlands | Spain | UK |
|---|---|---|---|---|---|
| | dF/dx | dF/dx | dF/dx | dF/dx | dF/dx |
| Female | -.031* | -.0067 | -.026* | -.009 | .000018 |
| Unmarried | .0048 | -.012 | -.009 | .007 | .0006 |
| House Tenant | .05** | .0023 | .004 | .013 | .0012 |
| Household Size | .01 | -.0035 | .0145** | .0048 | .00016 |
| Children | -.024 | -.027* | -.029* | .01 | -.0005 |
| Residence Mover | .0767** | -.017 | .012 | .02 | .0001 |
| Third Level Education | -.0146 | .0005 | .0027 | .008 | -.00046 |
| Lower Secondary Education | -.0077 | -.001 | -.0067 | .05 | -.00057 |
| On the Job Search | .165** | .157** | .1218** | .002** | .0047** |
| Experience | .0007 | -.006** | -.0004 | -.002* | -.0003** |
| Experience Squared | -.0001 | .00009 | -.00007 | .00001 | .00** |
| Employer Health Insurance | -.039 | -.0056 | .016 | -.012 | .0008 |
| Employer Provided Training | -.0157 | -.025 | -.0057 | -.002 | -.0014 |
| Occupational Pension | -.01 | .059** | -.034* | -.0988 | .0036 |
| Expected Portability Loss | - | -.07** | -.108** | .217 | -.0224** |
| Job Supervisory Status | -.02 | -.001 | -.0237* | -.02** | - |
| Manager & Professional | .0415* | .0035 | .0041 | -.014 | -.0003 |
| Blue Collar Worker | .0467* | .0518** | .0052 | .0188** | .0009 |
| Employer Size: 0-19 | .0216 | .0143 | .0034 | .007 | .0005 |
| Employer Size: 100+ | -.0232 | -.0146 | -.0437** | -.051** | -.006** |
| Construction | .0474* | .1** | -.0025 | .0865** | .001 |
| Trade, Hotels & Restaurants | -.0138 | .006 | -.024 | .0165 | .0007 |
| Services | -.019 | .05** | .0052 | -.0027 | .0011 |
| N. Observations | 1.178 | 1.117 | 1.426 | 2.091 | 1.404 |
| Log-Likelihood | -335.54 | -267.44 | -350.74 | -526.64 | -217.18 |
| Pseudo R2 | 15.35% | 21.11% | 19.84% | 17% | 29.87% |
| Observed P | 10.52% | 9.04% | 9.18% | 9.03% | 5.77% |
| Predicted P($\bar{X}$) | 7.38% | 4.8% | 5.38% | 3.86% | 0.14% |

[42] The parameter estimates represent the e¤ect of a one unit change in the independent variable on the probability of job mobility, evaluated at the sample mean. Those marked with one asterisk are signi…cant at 10% level, while those marked with two asterisks are signi…cant at 5% level.

Table 5. Wage Equations for Stayers Corrected for Sample Selection Bias*

| | Denmark | | | | Ireland | | | | Netherlands | | | | Spain | | | | UK | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coe¤. | $t_H$ | $t_B$ | $t_J$ | Coe¤. | $t_H$ | $t_B$ | $t_J$ | Coe¤. | $t_H$ | $t_B$ | $t_J$ | Coe¤. | $t_H$ | $t_B$ | $t_J$ | Coe¤. | $t_H$ | $t_B$ | $t_J$ |
| Female | -.107 | -5.77 | -7.6 | -6.86 | -.163 | -6.90 | -7.40 | -7.05 | -.139 | -7.31 | -8.46 | -7.36 | -.163 | -8.32 | -7.93 | -8.38 | -.205 | -10.09 | -10.61 | -10.12 |
| Third Level Education | .095 | 4.48 | 4.92 | 5.35 | .041 | 1.27 | 1.17 | 1.30 | .174 | 8.25 | 7.78 | 8.30 | .162 | 6.17 | 6.53 | 6.22 | .19 | 7.43 | 6.66 | 7.45 |
| Lower Secondary Education | -.044 | -1.78 | -2.25 | -2.12 | -.116 | -4.48 | -4.15 | -4.58 | -.023 | -1.14 | -.12 | -1.15 | -.092 | -4.12 | -4.3 | -4.16 | -.066 | -2.96 | -3.3 | -2.97 |
| Experience | .012 | 4.12 | 4.86 | 4.87 | .022 | 5.93 | 6.42 | 6.04 | .02 | 6.70 | 7.07 | 6.73 | .025 | 9.38 | 9.87 | 9.43 | .02 | 5.65 | 5.81 | 5.66 |
| Experience Squared | -.0002 | –4.29 | -4.76 | -5.11 | -.0003 | -4.3 | -4.35 | -4.39 | -.0003 | -5.10 | -5.50 | -5.14 | -.0004 | -7.62 | -7.69 | -7.67 | -.0004 | -5.72 | -5.91 | -5.74 |
| Occupational Pension | -.017 | -.85 | -.98 | -1.01 | .177 | 7.25 | 7.76 | 7.42 | .049 | 2.03 | 1.51 | 2.02 | .116 | 4.05 | 3.77 | 4.09 | .115 | 5.21 | 5.27 | 5.22 |
| Job Supervory Status | .036 | 1.92 | 2.52 | 2.30 | .106 | 4.53 | 4.90 | 4.64 | .038 | 2.37 | 2.48 | 2.39 | .134 | 6.88 | 7.46 | 6.93 | - | - | - | - |
| Manager & Professionals | .12 | 5.40 | 6.50 | 6.47 | .162 | 5.37 | 5.63 | 5.49 | .155 | 9.04 | 8.37 | 9.10 | .233 | 9.52 | 8.98 | 9.61 | .155 | 6.74 | 6.64 | 6.76 |
| Blue Collar Workers | -.07 | -2.85 | -3.61 | -3.37 | -.032 | -1.12 | -1.28 | -1.14 | -.045 | -2.08 | -1.98 | -2.09 | -.099 | -4.72 | -4.71 | -4.75 | -.118 | -4.52 | -5.74 | -4.53 |
| Employer Size: 0-19 | -.026 | -1.34 | -1.46 | -1.58 | -.166 | -6.48 | -6.80 | -6.60 | -.055 | -2.85 | -2.97 | -2.86 | -.188 | -10.11 | -10.85 | -10.17 | -.052 | -1.85 | -1.8 | -1.85 |
| Employer Size: 100+ | .031 | 1.45 | 1.88 | 1.75 | .027 | .88 | .85 | .91 | .019 | 1.10 | 1.13 | 1.11 | .151 | 6.08 | 5.92 | 6.13 | .065 | 2.84 | 2.63 | 2.86 |
| Construction | .043 | 1.47 | 1.97 | 1.72 | -.038 | –.86 | -1.11 | -.88 | -.111 | -4.33 | -4.58 | -4.36 | -.035 | -.96 | -1.02 | -.96 | -.015 | -.35 | -.39 | -.35 |
| Trade, Hotel & Restaurants | -.08 | -3.20 | -3.76 | -3.82 | -.119 | -3.98 | -4.1 | -4.08 | -.102 | -4.8 | -5.18 | -4.83 | -.123 | -5.48 | -5.45 | -5.52 | -.129 | -5.13 | -5.8 | -5.15 |
| Services | .013 | .63 | .76 | .75 | -.035 | -1.19 | -1.08 | -1.22 | -.004 | -.24 | -.23 | -.24 | -.007 | -.37 | -.34 | -.37 | .028 | 1.29 | 1.36 | 1.30 |
| $Lambda_S$ | .257 | 3.77 | 4.75 | 4.18 | .206 | 2.32 | 2.88 | 2.30 | .102 | 1.48 | 1.01 | 1.48 | .13 | 1.27 | 1.33 | 1.27 | .141 | 1.48 | 1.49 | 1.47 |
| Constant | 1.87 | 39.95 | | | 1.7 | 36.75 | | | 1.69 | 34.12 | | | 1.13 | 34.33 | | | 1.63 | 30.46 | | |
| N. Observations | 1.054 | | | | 1.016 | | | | 1.295 | | | | 1.902 | | | | 1.323 | | | |
| F test | 35.48 | | | | 59.93 | | | | 52.91 | | | | 125.69 | | | | 66.846 | | | |
| Prob>F | 0.00 | | | | 0.00 | | | | 0.00 | | | | 0.00 | | | | 0.00 | | | |
| R-Squared | 33.9% | | | | 47.34% | | | | 38.29% | | | | 49.99% | | | | 32.62% | | | |

* The t-ratios are computed following Heckman (1979) procedure ($t_H$ columns) as well as nonparametric Bootstrap ($t_B$ columns) and Jacknife ($t_H$ columns) methods.

Table 6 Wage Equations for Movers Corrected for Sample Selection Bias*

| | Denmark | | | | Irelands | | | | Netherlands | | | | Spain | | | | UK | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Coe¤. | $t_H$ | $t_B$ | $t_J$ | Coe¤. | $t_H$ | $t_B$ | $t_J$ | Coe¤. | $t_H$ | $t_B$ | $t_J$ | Coe¤. | $t_H$ | $t_B$ | $t_J$ | Coe¤. | $t_H$ | $t_B$ | $t_J$ |
| Female | -.16 | -3.32 | -3.32 | -3.17 | -.11 | -1.25 | -1.21 | -1.15 | .022 | .33 | .30 | .31 | -.252 | -3.49 | -3.34 | -3.50 | -.049 | -.71 | -.55 | -.64 |
| Third Level Education | .143 | 2.51 | 1.85 | 2.40 | .013 | .12 | .08 | .11 | .04 | .57 | .57 | .53 | .008 | .08 | .08 | .09 | .24 | 2.94 | 2.25 | 2.66 |
| Lower Secondary Education | -.023 | -.39 | -.48 | -.38 | -.015 | -.16 | -.16 | -.15 | .04 | .56 | .47 | .53 | -.153 | -1.83 | -2.14 | -1.84 | -.045 | -.61 | -.50 | -.55 |
| Experience | .024 | 3.15 | 3.07 | 3.02 | .044 | 2.92 | 2.77 | 2.68 | .018 | 1.89 | 1.92 | 1.78 | .011 | 1.27 | 1.34 | 1.28 | .035 | 3.01 | 3.15 | 2.72 |
| Experience Squared | -.0006 | -3.02 | -2.98 | -2.87 | -.001 | -2.9 | -2.59 | -2.67 | -.0005 | -1.8 | -1.8 | -1.69 | -.0002 | -1.27 | -1.26 | -1.27 | -.0007 | -2.84 | -2.89 | -2.56 |
| Occupational Pension | -.028 | -.64 | -.576 | -.61 | .227 | 2.43 | 1.80 | 2.24 | .212 | 3.52 | 2.93 | 3.30 | -.09 | -.25 | -.72 | 1.24 | .296 | 3.36 | 2.72 | 3.04 |
| Job Supervisory Status | -.078 | -1.53 | -1.46 | -1.46 | .032 | .36 | .29 | .33 | .193 | 3.03 | 3.43 | 2.84 | .151 | 1.74 | 1.88 | 1.74 | | | | |
| Manager & Professional | .179 | 2.84 | 2.20 | 2.71 | .40 | 3.57 | 1.96 | 3.29 | .223 | 3.57 | 2.42 | 3.34 | .266 | 2.3 | 2.00 | 2.29 | .177 | 2.20 | 1.62 | 2.00 |
| Blue Collar Worker | -.154 | -2.75 | -3.06 | -2.64 | -.064 | -.65 | -.51 | -.60 | -.139 | -1.87 | -1.50 | -1.75 | -.094 | -1.43 | -1.8 | -1.45 | .058 | .72 | .73 | .65 |
| Employer Size: 0-19 | -.027 | -.62 | -.55 | -.59 | -.13 | -1.72 | -1.48 | -1.58 | -.133 | -2.33 | -1.91 | -2.19 | -.124 | -2.16 | -2.72 | -2.18 | -.2 | -3.00 | -2.98 | -2.74 |
| Employer Size: 100+ | .042 | .62 | .73 | .59 | -.173 | -1.17 | -.99 | -1.08 | .064 | .74 | 1.00 | .69 | -.171 | -.57 | -.71 | -.56 | -.142 | -.72 | -.52 | -.65 |
| Construction | .07 | 1.13 | 1.23 | 1.08 | -.087 | -.67 | -.56 | -.62 | -.133 | -1.50 | -1.50 | -1.40 | .178 | 1.54 | 1.82 | 1.56 | .19 | 1.47 | 1.20 | 1.33 |
| Trade, Hotel and Restaurants | -.107 | -1.73 | -1.37 | -1.66 | -.17 | -1.25 | -1.02 | -1.15 | -.126 | -1.59 | -1.90 | -1.50 | -.055 | -.66 | -.66 | -.66 | -.043 | -.52 | -.45 | -.47 |
| Services | -.025 | -.45 | -.47 | -.43 | -.212 | -2.03 | -1.26 | -1.87 | -.097 | -1.50 | -1.20 | -1.41 | .057 | .68 | .74 | .68 | -.048 | -.63 | -.53 | -.57 |
| $Lambda_m$ | 0.99 | 1.55 | 1.67 | 1.49 | -.065 | -.63 | -.52 | -.58 | .023 | .35 | .38 | .33 | .25 | 1.62 | 1.17 | 1.64 | -.00004 | -.00 | -.00 | .00 |
| Constant | 1.63 | 13.8 | | | 1.73 | 9.88 | | | 1.54 | 14.08 | | | 1.13 | 4.15 | | | 1.36 | 9.41 | | |
| N. Observations | 124 | | | | 101 | | | | 131 | | | | 189 | | | | 81 | | | |
| F test | 6.94 | | | | 3.80 | | | | 7.05 | | | | 5.54 | | | | 3.77 | | | |
| Prob > F | 0.00 | | | | 0.00 | | | | 0.00 | | | | 0.00 | | | | 0.00 | | | |
| R-Squared | 49.06% | | | | 40.14% | | | | 47.9% | | | | 35.27% | | | | 44.44% | | | |

* The t-ratios are computed following Heckman (1979) procedure ($t_H$ columns) as well as nonparametric Bootstrap ($t_B$ columns) and Jacknife ($t_H$ columns) methods.

Table 7. Structural Form Probit Model[43]

| | Denmark | Ireland | Netherlands | Spain | UK |
|---|---|---|---|---|---|
| | dF/dx | dF/dx. | dF/dx | dF/dx | dF/dx |
| Wage Dierential | .07 | .07 | -.144** | .035 | .023** |
| Female | -.037** | -.016 | -.007 | -.02* | -.0038** |
| Unmarried | .0077 | -.0178 | -.008 | .0127 | .0014 |
| House Tenant | .048** | .0007 | .003 | .0155 | .0031 |
| Household Size | .0117 | -.0022 | .015** | .0107** | .0002 |
| Children | -.024 | -.025 | -.028* | .0117 | -.0017 |
| Residential Mover | .087** | -.0076 | .0115 | .026 | .0029 |
| Third Level Education | -.0165 | -.0046 | -.01 | .0117 | -.0017 |
| Lower Secondary Educat. | .004 | -.007 | -.0035 | .0415** | -.0035 |
| On the Job Search | .178** | .1466** | .1246** | .0965** | .0119** |
| Experience | -.00022 | -.0095** | -.001 | -.0038** | -.0013** |
| Experience Squared | -.00007 | .0001** | -.00008 | .00003 | .00002** |
| Employer Health Insurance | -.0485* | -.003 | .0113 | -.028** | .0006 |
| Employer Provided Training | -.0245 | -.029 | -.006* | -.035** | -.004* |
| Expected Portability Loss | - | -.038** | -.13** | -.0658 | -.0577** |
| Occupational Pension | -.0145 | - | - | - | - |
| Log-Likelihood | -342.36 | -281.51 | -357.32 | -567.33 | -231.9 |
| Wald chi2 (15) | 97.03 | 102.7 | 121.64 | 126.26 | 93.00 |
| Prob > chi2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Pseudo R2 | 13.63% | 16.96% | 18.33% | 10.58% | 25.12% |
| Observed P | 10.52% | 9.04% | 9.18% | 9.04% | 5.77% |
| Predicted P($\bar{X}$) | 7.8% | 5.87% | 5.67% | 6.57% | 0.55% |

[43] The parameter estimates represent the eect of a one unit change in the independent variable on the probability of job mobility, evaluated at the sample mean. Those marked with one asterisk are signi…cant at 10% level; those marked with two asterisks are signi…cant at 5% level. Standard errors are corrected for heteroskedasticity.

Table 8. Sample and Predicted Mobility Rates (%)

| | Denmark | | Ireland | | Netherlands | | Spain | | UK | |
|---|---|---|---|---|---|---|---|---|---|---|
| Mobility Rate | Sample | Pred. | Sample | Pred. | Sample | Pred. | Sample | Pred. | Sample | Pred. |
| Pension | 8.7 | 9.7 | 5.1 | 4.4 | 6.7 | 6.3 | 0.0 | 1.9 | 2.1 | 1.6 |
| No Pension | 13.4 | 13.1 | 11.6 | 12.1 | 21.7 | 21.6 | 9.9 | 9.7 | 9.9 | 10.5 |
| Male Pension | 11.5 | 11.3 | 5.4 | 4.4 | 7.2 | 6.6 | - | 2 | 2.3 | 1.9 |
| Male No Pension | 13.3 | 14.3 | 11.5 | 12.4 | 23.4 | 23 | 11.7 | 10.2 | 10.4 | 11.2 |
| Fem. Pension | 5.7 | 6.4 | 4.4 | 4.4 | 4.8 | 4.9 | 2.3 | 1.7 | 1.5 | 0.9 |
| Fem. No Pension | 13.7 | 10.1 | 11.7 | 11.6 | 18.8 | 18.9 | 8.2 | 8.4 | 9.2 | 9.3 |

Table 9. Assumptions for Portability Loss Computation

| | Ireland | Netherlands | Spain | UK |
|---|---|---|---|---|
| Annual Accrual Rate | 1/60 | 1.75% | 1.75% | 1/60 |
| Pensionable Wage | Final Wage | Final Wage | Final Wage | Final Wage |
| Normal Retirement Age | 65 | 65 | 65 | 65 |
| Exp. Real Wage Growth Rate | 4% | 3% | 4% | 2% |
| Expected In‡ation Rate | 2% | 3% | 2% | 4% |
| Nominal Wage Growth Rate | 6% | 6% | 6% | 6% |
| Post-Retirement Indexation | 1,5% | 2% | 2% | 4% |
| Early Leavers' Indexation | - | 2% | - | 4% |
| Nominal Discount Rate | 6%. | 6% | 6% | 6% |
| In‡ation Adjusted Discount Rate | 4,5% | 4% | 4% | 2% |